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[54] **INFLATOR CAPABLE OF MODULATION
AIR BAG INFLATION RATE IN A VEHICLE
OCCUPANT RESTRAINT APPARATUS**

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[51] **Int. Cl.⁷** **B60R 21/26**

[52] **U.S. Cl.** **280/736; 280/742; 280/741**

[58] **Field of Search** **280/741, 737,
280/742, 736**

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[57] **ABSTRACT**

In an occupant restraint apparatus for installation in a vehicle, a smart airbag inflator is provided with a piston for regeneratively pumping liquid propellant from a reservoir into a combustion chamber for ignition and combustion to generate airbag inflation gases. To control the airbag inflation rate, the piston includes a piston head slidably received in a damping chamber filled with a magneto-rheological fluid that is pumped through an orifice during the regenerative pumping stroke of the piston. An electromagnet is selectively energized to produce a varying magnetic field to adjust the viscosity of the magneto-rheological fluid flowing through the orifice and thus vary a damping force exerted on the piston stroke, thereby modulating the rate of liquid propellant combustion. Electromagnet current excitation is controlled in response to a particular accident scenario.

38 Claims, 2 Drawing Sheets